Temporal changes of ^{7}Be and PM_{10} concentrations in surface air at a coastal Mediterranean station

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Abstract

Levels of particulate matter fraction PM_{10} were monitored between 2005 and 2010 in Málaga (Spain). The station “Carranque” (4º 28’ 4” W; 36º 43’ 40” N), belongs to the Atmospheric Pollution Monitoring network managed by the Environmental Health Service of the Andalusian Government. PM_{10} concentrations were measured at “Carranque” station by the beta attenuation method. The ^{7}Be concentrations in air was continuously monitored, using an air sampler (Radeco, mod. AVS-28A) at a flow rate of 40 l/min and a high-resolution gamma-ray spectrometer, at the University of Málaga, (4º 28’ 4” W; 36º 43’ 40” N). Long-term measurements of cosmogenic radionuclides such as ^{7}Be provide important data in studying of global atmospheric processes and comparing environmental impact of radioactivity from man-made sources to natural ones. The period of measurements was performed from 2005 to 2010. The variation of the data with time was studied by time series analyses and seasonal patterns were identified. The concentrations of ^{7}Be exhibited maximum specific activities in spring and summer and one minimum in winter. The maximum concentrations for PM_{10} were observed in summer. Plots of the frequency distribution show highly skewed (flat on the right) histogram for PM_{10} and a symmetric for ^{7}Be. The concentration data of ^{7}Be and PM_{10} with meteorological variables were correlated to understand the monthly variation of these radionuclides in air. A complex relationship was observed between PM_{10} and ^{7}Be concentrations in the measured aerosol filters collected at this site. Due to this fact, the analysed atmospheric events had to be grouped in: a) high ^{7}Be and high PM_{10} matter events. b) Low ^{7}Be and high PM_{10} matter events and c) high ^{7}Be and low PM_{10} matter events. This study has shown that although ^{7}Be and PM_{10} are associated with different source in Malaga, they may reach high concentration simultaneously. The reason for this is the concurrent concurrence of subsidence processes over North Africa (resulting in the downward transport of ^{7}Be from the mid-troposphere) and the suspension of mineral dust over desert region with a subsequent transport to Malaga.

Also we have estimated the doses ^{7}Be in the air aerosols from air inhalation in three the analysed atmospheric events and the values of PM_{10} exceeds the European legislation

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